

ABSTRACT

A device for measuring fluid flow rates over a wide range of flow rates (<1 nL/min to >10 μ L/min) and at pressures at least as great as 2,000 psi. The invention is particularly adapted for use in microfluidic systems. The device operates by producing compositional variations in the fluid, or pulses, that are subsequently detected downstream from the point of creation to derive a flow rate. Each pulse, comprising a small fluid volume, whose composition is different from the mean composition of the fluid, can be created by electrochemical means, such as by electrolysis of a solvent, electrolysis of a dissolved species, or electrodialysis of a dissolved ionic species. Measurements of the conductivity of the fluid can be used to detect the arrival time of the pulses, from which the fluid flow rate can be determined. A pair of spaced apart electrodes can be used to produce the electrochemical pulse. In those instances where it is desired to measure a wide range of fluid flow rates a three electrode configuration in which the electrodes are spaced at unequal distances has been found to be desirable.